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मानक

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IS 11498 (1985): Lever Type Dial Gauges [PGD 25:  
Engineering Metrology]



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“Knowledge is such a treasure which cannot be stolen”



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Indian Standard

# SPECIFICATION FOR LEVER TYPE DIAL GAUGES

**1. Scope** — Covers the requirements of lever type dial gauges of an accuracy of 0.01 mm.

**2. Design** — The general design shall be such that the performance of the dial gauge shall be under all normal methods of operation, in concurrence with the requirements laid down herein.

## 2.1 Dial

**2.1.1** The dial shall be graduated with sharp lines which contrast with the background permitting ease of reading as shown in Fig. 1.

**2.1.2** The width of the scale mark shall not be less than 0.15 mm and not more than 0.25 mm.

**2.1.3** Every tenth division shall be indicated by a numbered longer line and every fifth division line shall be slightly shorter than the tenth division line but longer than the unit division line, as shown in Fig. 1.

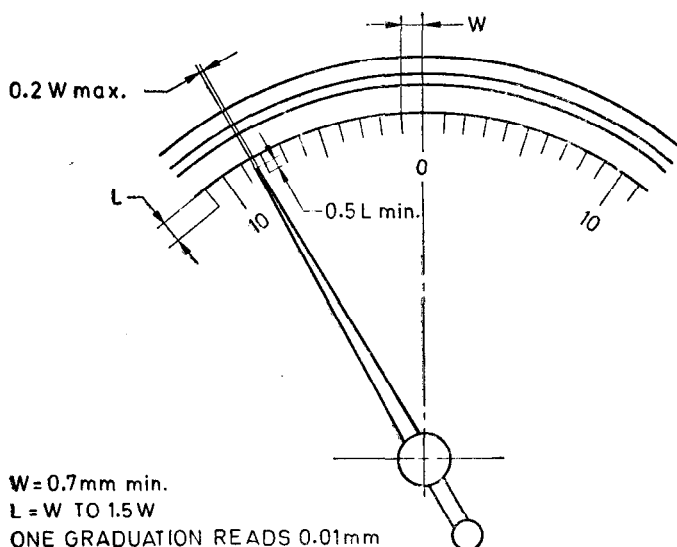


FIG. 1 DETAILS OF DIAL

**2.2 Fixing Devices** — Lever type dial gauges shall be clamped by a male dovetail spigot as shown in Fig. 2A which may be integral with the gauge or removable.

Fixing may also be effected by clamping the spigot of the gauge.

**2.2.1** For dial gauges having the dovetail fixing, the connected clamping device shall have dovetail as shown in Fig. 2B.

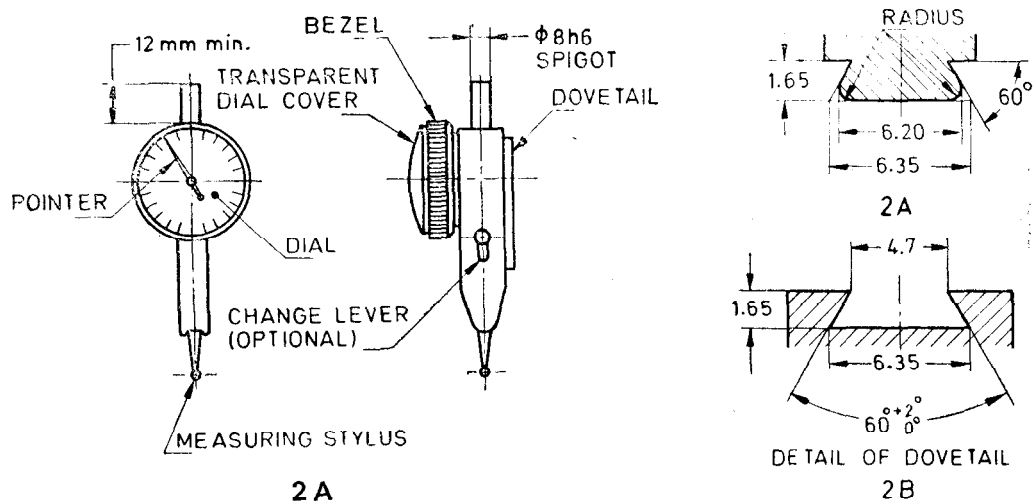
**2.2.2** In case of spigot clamping, the hole in which the spigot is secured shall be a close round fit when tightened. It is recommended that the tolerance on the hole shall be H7.

**2.3 Measuring Range** — The measuring range of these dial gauges is the amount of movement, generally of the stylus (lever), which corresponds to one revolution of the pointer.

**2.4 Pointer** — The length of the pointer shall be such that it covers approximately half of the length of the shortest graduation line. The width of the tip of the pointer shall not exceed one fifth of the width of one scale division and should preferably be of approximately the same width at the graduation line (see Fig. 1).

To reduce parallax errors, the pointer should be as close to dial as practicable.

The movement of the pointer shall be free from any jerkiness.



All dimensions in millimetres.

FIG. 2 NOMENCLATURE AND CLAMPING DIMENSIONS

**2.5 Stylus (Lever)** — The force required to operate the dial gauge should be as light as possible.

It is recommended that this force should not exceed 0.5 N for either direction of operation of the stylus. The stylus spherical tip shall be well finished and of heat treated steel with hardness not less than 700 HV and with 2 mm diameter unless otherwise specified [see IS : 1501-1968 Method for Vickers hardness test for steel (*first revision*) ]. But for particular applications 1 mm or 3 mm diameter tip stylus may also be supplied if required by the purchaser.

Frictional force of the stylus slip mechanism shall not be less than 2 N.

**3. Performance** — The dial gauge in either direction of operation and throughout its range shall satisfy the requirements at 3.1 and 3.2. These requirements shall be achieved without resort to tapping the gauge. They shall not be applicable to five divisions at the beginning of the travel and at the end of the travel of the pointer. Methods of testing lever type dial gauges are given in Appendix A.

**Note** — To minimize inaccuracy, it is recommended that the gauge shall be applied to the work with the stylus normal to the direction of measurement; the inclination, if any, of the stylus shall be limited to 15° maximum.

**3.1 Repeatability** — Dial gauge shall be able to repeat its readings for a given measured length under all normal conditions of use.

**3.2 Sensitivity** — The dial gauge shall be able to respond to small changes of the quantity measured. The gauge shall indicate change of 0.002 mm.

**4. Calibration** — The calibration shall be the total variation between the maximum and minimum reading obtained by taking several readings at various intervals over the working range of the dial gauge. The permissible errors may vary according to the displacements applied at right angles to the stylus.

The measured errors thus obtained shall be within the tolerances given in Table 1 and shall vary according to the magnitude of the displacements. This is applicable to both the directions of the movements of the stylus.

TABLE 1 TOLERANCES ON ERRORS OF READING FOR 0.01 mm READING LEVER TYPE DIAL GAUGES

Requirement Over an Interval of	Limits of Error mm
Any 0.1 mm	0.005
Any half revolution	0.01
Total	0.015

**5. Hysteresis** — The ability of the gauge to repeat to its readings when measurements of the same value are made in either of the two directions of the stylus.

The difference if any between the measured value shall not be more than 0.003 mm.

**6. Care and Use of Lever Type Dial Gauge** — Notes on the care and use of lever type dial gauge are given in Appendix B.

## 7. Workmanship and Finish

**7.1** The coating and plating on all parts shall be uniformly applied and shall be free from easy discolouring, peeling and rusting.

**7.2** All working parts shall not produce any inaccuracies detrimental to practical use under normal working temperature and humidity conditions.

**7.3** The appearance of principal parts, condition of finish, stamped marks, marking and scales, etc, shall not show any defect.

**7.4** When holding the dial gauge in any position, movement of the lever over its range shall be smooth and without any resistance.

**7.5** The rotation of dial shall be smooth.

**8. Marking** — Each lever type dial gauge shall be marked legibly and permanently with the scale interval, the manufacturer's name or trade-mark.

## APPENDIX A

( Clause 3 )

### METHODS OF TESTING LEVER TYPE DIAL GAUGES

**A-1. Calibration** — The calibration of the lever type dial gauge shall be carried out by using different gauge blocks to cover the measuring range at suitable intervals, wrung on a surface plate and dial gauge readings taken.

Alternatively, the calibration may be checked against a calibrated micrometer drum as shown in Fig. 3. The dial gauge is held rigidly with the stylus normally at right angles to the axis of micrometer drum.

In both the methods the several readings taken are compared with specified tolerances.

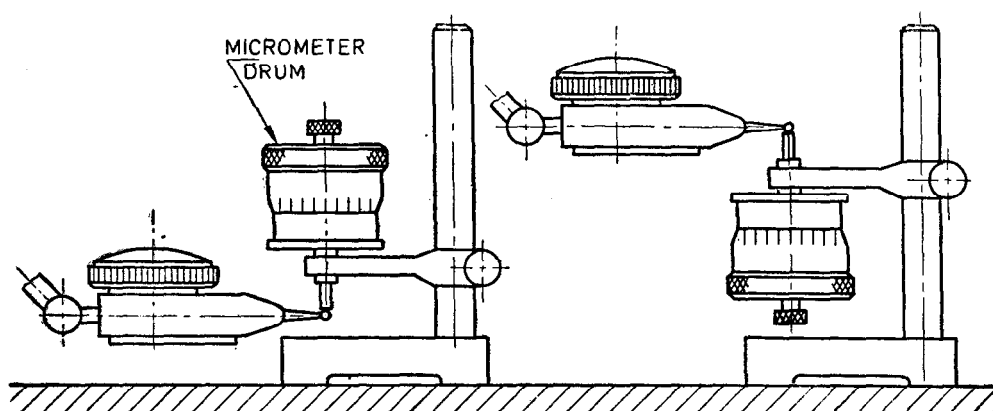


FIG. 3 METHOD OF TESTING BY USING MICROMETER DRUM

**A-2. Repeatability** — The lever type dial gauge is securely fixed to a rigid stand which can be moved on a surface plate. Then it is applied with stylus normal to the surface of two gauge blocks with a small difference, a number of times and the readings noted (see Fig. 4). It is recommended that the difference between the two slips is 0.01 mm.

**A-3. Sensitivity** — The lever type dial gauge should essentially be free from stickyness or backlash and this can be easily conformed by securely fixing the dial gauge on rigid stand with its stylus in contact with slightly eccentric mandrel mounted between centres. The actual eccentricity of the mandrel shall be determined by a more sensitive equipment. The gauge under test should indicate this eccentricity to within 0.002 mm.

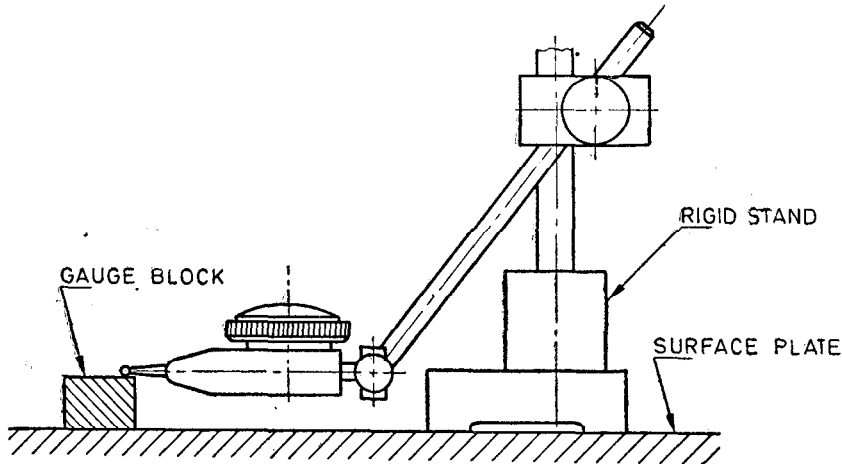


FIG. 4 METHOD OF TESTING BY USING GAUGE BLOCKS

## APPENDIX B

( Clause 6 )

### CARE AND USE OF LEVER TYPE DIAL GAUGES

**B-1. General Precautions** — To maintain the accuracy of the dial gauge care should be taken to avoid shocks to the gauge of such nature which may damage its mechanisms.

**B-1.1** When not in use, the gauge should be kept in a case to avoid dust from coming into contact with it. If at any time the movement is found to be faulty, it is advisable to return the gauge to the manufacturer for necessary rectification.

**B-2. Clamping** — The dial gauge should be held in a stand which is robust and heavier than the measuring force of the gauge. The base of the stand should be well polished and should be moved on a surface plate with Grade A accuracy. The over-hang of the dial gauge should be as less as practicable.

**B-2.1** While transferring a reading with a lever type dial gauge, the size of the master shall be as close to the workpiece as possible so that the movement is restricted to a minimum number of divisions of the pointer.

**B-3.** Whatever means are provided on the dial gauge for clamping purposes, be it a spigot or dovetail fixing, proper clamping is very essential for getting accurate readings. The base on the stud on which the gauge is mounted should be heavy and stable to ensure accurate readings.

## EXPLANATORY NOTE

Lever type dial gauge is a type of measuring instrument where the movement of a lever or stylus is transmitted as rotational motion to terminate at a point on a dial suitably marked, to indicate the amount of displacement of the lever. It is suitable for making measurements where the commonly used plunger type dial gauges would not be suitable. Other lever type dial gauges are also made as shown in Fig. 5 for some particular applications.

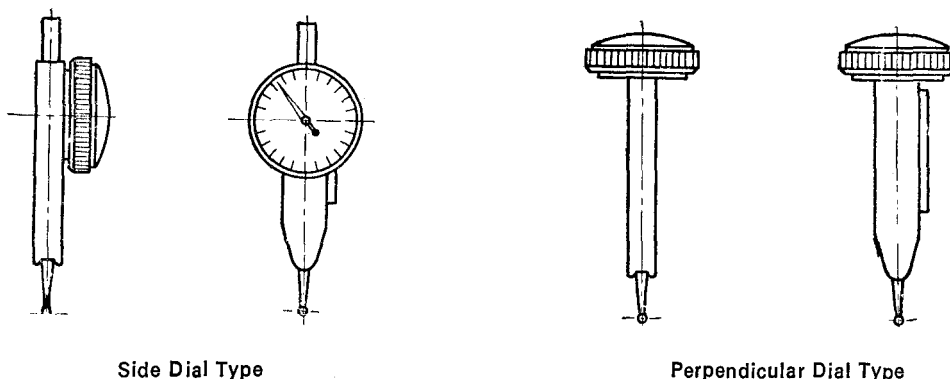


FIG. 5 LEVER TYPE DIAL GAUGES FOR PARTICULAR APPLICATIONS

In preparation of this standard, considerable assistance has been derived from the following standards:

BS 2795 : 1981	Dial test indicator (lever type) for linear measurement, issued by British Standards Institution (BSI).
DIN 2270-1976	Dial test indicator (lever type) for linear measurements, issued by Deutsches Institut für Normung (DIN).
JIS B 7533-1975	Lever type dial test indicator, issued by Japanese Industrial Standards Committee (JISC).